

REMARKS

This application is amended in a manner to place it in condition for allowance at the time of the next Official Action.

**Status of the Claims**

Claim 1 is amended. Support for the amendment to claim 1 may be found in original claim 5, and paragraph [0038] of the originally filed specification, which discloses "25-80 vol% of RON 96-102 and 50-90 vol% of RON 93-96".

Claim 6 is amended to depend from 1.

Claims 5 and 7 are cancelled.

Claims 1-4, 6, and 8-16 remain in this application.

**Claim Rejections-35 USC §103**

Claims 1-11 were rejected under 35 U.S.C. §103(a) as being unpatentable over SAITOU et al. US 20030213728 ("SAITOU") and in view of MATSUMOTO et al. US 20030023120 ("MATSUMOTO"). This rejection is respectfully traversed for the reasons below.

SAITOU does not disclose:

- a cracked naptha fraction having a 5 vol% distillation temperature of 25°C or more, a 95 vol% distillation temperature of 210°C or less, an olefin content of 5 mass% or more and a diene value or 0.3g/100g or less,

- a desulfurization treatment which causes the cracked naphtha to come on contact with a porous desulfurization agent having a sulfur sorption function in the presence of hydrogen under hydrogen partial pressure or 1 MPa or less, or
- a method for producing the unleaded gasoline composition having a sulfur content or 1 mass ppm or less by using 25-90 vol% of a desulfurized cracked naphtha fraction.

Instead, SAITOU teaches that cracked gasoline or light catalytic cracked gasoline can be desulfurized by hydrotreating, adsorption in paragraph [0064], etc. The cracked gasoline is obtained by subjecting heavy oil to the fluid catalytic cracking process, and the light cracked gasoline is obtained by distillation of cracked gasoline. The properties of the cracked gasoline are described as composition \*10 and \*11 in Table 4 (The Official Action appears to have mistakenly referred to composition \*13).

However, SAITOU does not disclose a diene value of these cracked gasolines, or in any examples of their desulfurization. Instead, SAITOU simply uses the cracked gasolines as gasoline base material for a fuel in Table 5. The diene value of the cracked gasoline is generally more than 0.3g/100g, as shown by the value of catalytically cracked

gasoline A, D and E being in the range of 0.6–1.6g/100g (See Tables 1 and 2 of the present specification).

Therefore, the diene value of Table 4 compositions \*10 & \*11 in SAITOU is presumed to be more than 0.3g/100g because a diene-reducing treatment was not carried out on these compositions. If the diene value is more than 0.3g/100g, the desulfurization performance of the porous desulfurization agent is impaired, resulting in difficulty of desulfurizing sulfur compounds, particularly, thiophene compounds.

In addition, as shown in paragraphs 0051–0054 and Table 4 in the present specification, the diene value is not reduced by desulfurization using a porous desulfurization agent.

MATSUMOTO fails to remedy these shortcomings of SAITOU for reference purposes. MATSUMOTO teaches that deeply desulfurized light naphtha can be produced by desulfurization of desulfurized light naphtha, for example, through a hydro-refining method, followed by desulfurization by use of a nickel-based adsorption desulfurizing agent [0055]. MATSUMOTO, however, does not teach applying the desulfurization process to a cracked naphtha fraction.

MATSUMOTO discloses an adsorption desulfurization wherein the deeply desulfurized light naphtha C having a sulfur content 0.008 wt. ppm was obtained by desulfurization of the deeply desulfurized light naphtha B having a sulfur content 0.1 wt. ppm using a nickel-based adsorption desulfurizing agent

[0105]. But, unlike the invention according to claim 1, this desulfurization was not carried out in the presence of hydrogen under hydrogen partial pressure of 1 MPa or less.

Indeed, since the desulfurization of the present invention is carried out in the presence of a small amount of hydrogen, it can be efficiently done without hydrogenation of olefins.

Further, because the deeply desulfurized light naphtha of MATSUMOTO consists of C4 to C7 normal paraffin, iso-paraffin, naphthene, etc [0049], it presumably hardly contains any olefin and aromatics. Although MATSUMOTO does not clearly mention, but describes desulfurizing deeply desulfurized light naphtha to a sulfur content of 0.1 wt. ppm before being subjected to adsorption desulfurization, it is also presumed that the olefins must have been hydrogenated during the first desulfurization process. Thus, naphtha B hardly contains olefin unlike the cracked naphtha of the present invention which has an olefin content of 5 mass% or more.

The present invention can reduce the sulfur content to 1 mass ppm or less and leave olefin content unchanged by desulfurizing the cracked naphtha fraction having an olefin content of 5 mass% or more, which has high octane number, by using a porous desulfurization agent in the presence of a small amount of hydrogen after reducing diene content to a diene value of 0.3g/100g or less. In contrast, MATSUMOTO does not show how to

desulfurize an olefin-containing fraction without reducing olefins.

There would have been no motivation to apply the desulfurization agent used for the deeply desulfurized light naphtha having a small amount of olefins and aromatics to the cracked naphtha fraction having a large amount of olefins and aromatics (see Tables in the present specification).

Therefore, the invention described in claims 1-4, 6 and 8-11 is not obvious over SAITOU in view of MATSUMOTO, and withdrawal of the rejection is respectfully requested.

Claims 12-16 were rejected under 35 U.S.C. §103(a) as being unpatentable over SAITOU in view of MATSUMOTO, in view of COKER et al. US 6,913,688 ("COKER") and as evidenced by FLETCHER et al. ("FLETCHER"). This rejection is respectfully traversed for the reasons below.

SAITOU teaches a fuel having a research octane number of 89.0 or more, a 50 vol% distillation temperature of 60°C or higher and 120°C or lower, an olefin content of 35 vol% or less, and sulfur content of 50 mass ppm or less. However, SAITOU does not teach having a proportion of thiophene compounds to the total sulfur compounds of 50 mass% or more, as sulfur.

The gasoline composition of claim 12 of the present invention recites a research octane number of 89.0 or more, a 50 vol% distillation temperature of 105°C or less, an olefin content of 10 vol% or more, and sulfur content of 1 mass ppm or less is

encompassed by the composition suggested by SAITOU. However, the composition of claim 12 makes a selective invention over SAITOU.

That is, SAITOU does not disclose any working example of a fuel which satisfies all the limitations of claim 12 (see Table 5 in SAITOU). Specifically, none of the fuels has an olefin content of 10 vol% or more. Further, SAITOU fails to disclose or suggest the content of thiophene compounds as sulfur.

MATSUMOTO teaches a fuel using deeply desulfurized naphtha consisting of C4 to C7 normal paraffin, iso-paraffin, naphthene, etc. and hardly containing olefin and aromatics. Accordingly, even if one were to combine SAITOU's fuel with MATSUMOTO's fuel, one would not arrive at the claimed fuel composition of the present invention.

FLETCHER does not remedy the shortcomings of the combination of SAITOU and MATSUMOTO for reference purposes. FLETCHER teaches an olefinic sulfur-containing compound which has a sulfur content of at least 50 ppm (see claims 1 and 17), but does not mention the olefinic sulfur-containing compound is 2-methylthiophene. A thiophene is a cyclic sulfur compound, and it is clear that FLETCHER regarded thiophene to be a cyclic sulfur compound from the phrase, "... thiophene and other cyclic sulfur compounds in column 4, lines 62-64.

However, the proportion of thiophene compound to the sulfur compounds of 50% or more or the amount of sulfur is not inherently taught by FLETCHER, as alleged in the Official Action.

That is, one cannot calculate a proportion or the amount of thiophene compound when the total amount of sulfur is unknown. Accordingly, this allegation is groundless.

Furthermore, COKER also cannot remedy the deficiencies of SAITOU and MATSUMOTO for reference purposes. COKER teaches a process for hydrodesulfurizing olefinic naphtha feedstreams and retaining a substantial amount of the olefins. The feedstreams contain at least about 5 wt. % olefins. A product stream contains at least 5.0 wt. ppm sulfur. However, COKER does not teach the amount of olefins in the product which has a sulfur content of 1 mass ppm or less.

Therefore, the present invention as defined by claims 12-16 is not obvious over SAITOU in view of MATSUMOTO and COKER, and as evidenced by FLETCHER, and withdrawal of the rejection is respectfully requested.

### **Conclusion**

In view of the amendment to the claims and the foregoing remarks, this application is in condition for allowance at the time of the next Official Action. Allowance and passage to issue on that basis is respectfully requested.

Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to our credit card which is being paid online simultaneously herewith for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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